

Claims

What is claimed and desired to be secured by Letters Patent is as follows:

1. A power generation apparatus for placement in a roadway subject to vehicles passing thereover, said apparatus comprising:
 - a) a road surface;
 - b) a plurality of cylinders, each of said cylinders having a piston slidably mounted therein and a fluid cavity beneath said piston, each of said pistons having an upper face extendable above said road surface so as to be engageable by passing vehicles;
 - c) a fluid source connected to said cylinders and supplying fluid to said fluid cavities thereof; and
 - d) power conversion means connected to said cylinders; wherein
 - e) as a passing vehicle engages said pistons, the weight of the vehicle pushes said pistons downwardly and causes fluid to flow from said fluid cavity toward said conversion means which converts said flow to useable energy.

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2. The apparatus as in Claim 1 wherein each said cylinder includes only one fluid port, said fluid port being connected to a respective check valve, said check valve also being fluidly connected to said fluid source and to said conversion means, said check valve allowing fluid to flow from said fluid source to said cylinder and from said cylinder to said conversion means but preventing flow from said cylinder to said fluid source or from said conversion means to said cylinder.
3. The apparatus as in Claim 1 wherein said cylinders are mounted between parallel cylinder supports, alternate ones of said supports being first supports having a supply passage formed therein, each said supply passage connecting respective ones of said cylinders to said fluid source, the remainder of said supports being second supports having a pressure passage formed therein, each said pressure passage connecting respective ones of said cylinders to said conversion means.
4. The apparatus as in Claim 3 wherein each said cylinder includes only one fluid port, said fluid port being connected to a respective check valve, said check valve also being connected to a respective one of said supply passages and a respective one of said pressure passages, said check valve allowing fluid to flow from said supply passage to said cylinder and from said cylinder to said pressure passage but preventing flow from said cylinder to said supply passage or from said pressure passage to said cylinder.

5. The apparatus as in Claim 4 wherein each said check valve is connected to said respective pressure passage by a telescoping union fitting; said fitting comprising:
 - a) an outer section having a first end, a second end, and a bore extending therethrough, said first end being threadably receivable by a threaded opening in one of said second supports, said second end including an axial opening communicating with said bore and an inwardly facing annular thrust surface adjacent said opening; and
 - b) an inner section slidably receivable within said bore, said inner section having a first end and a second end, said first end being sized to pass through said opening and threadably receivable by a threaded opening in said check valve, said second end including an outwardly facing annular thrust surface adjacent said axial opening; wherein
 - c) as said first ends are tightened into said threaded receivers, said union fitting is placed in tension such that said inwardly facing thrust surface on said outer section seals against said outwardly facing thrust surface on said inner section.
6. The apparatus as in Claim 5 wherein said union fitting further includes an annular groove formed in one of said thrust surfaces and an O-ring seal seated in said annular groove.

7. The apparatus as in Claim 4 wherein each said check valve is connected to said respective supply passage by a telescoping union fitting; said fitting comprising:
 - a) an outer section having a first end, a second end, and a bore extending therethrough, said first end being threadably receivable by a threaded opening in one of said first supports, said second end including an axial opening communicating with said bore and an inwardly facing annular thrust surface adjacent said opening; and
 - b) an inner section slidably receivable within said bore, said inner section having a first end and a second end, said first end being sized to pass through said opening and threadably receivable by a threaded opening in said check valve, said second end including an outwardly facing annular thrust surface adjacent said axial opening; wherein
 - c) as said first ends are tightened into said threaded receivers, said inwardly facing thrust surface on said outer section seals against said outwardly facing thrust surface on said inner section.
8. The apparatus as in Claim 7 wherein said union fitting further includes an annular groove formed in one of said thrust surfaces and an O-ring seal seated in said annular groove.

9. The apparatus as in Claim 1 wherein said piston upper faces are upwardly convex.
10. The apparatus as in Claim 1 wherein said piston is biased upwardly by a spring.
11. The apparatus as in Claim 10 wherein:
- a) said piston includes an upper section and a lower section connected together by an intermediate rod;
 - b) an annular ledge extends into said cylinder from a cylinder wall thereof between said upper and lower piston sections; and
 - c) said spring is a compression spring positioned between said upper piston section and said annular ledge.
12. The apparatus as in Claim 11 wherein said upper piston section is removable from said intermediate rod through an upper end of said cylinder.
13. The apparatus as in Claim 3 wherein said road surface comprises a mat supported on said cylinder supports.
14. The apparatus as in Claim 3 wherein at least some of said supports further include a temperature control passage through which a temperature control fluid may be circulated.

15. The apparatus as in Claim 14 wherein said temperature control fluid is a heated fluid heated by energy from said conversion means.
16. A power generation apparatus for placement in a roadway subject to vehicles passing thereover, said apparatus comprising:
 - a) a road surface;
 - b) a plurality of hydraulic cylinders, each of said cylinders having a piston slidably mounted therein and a fluid cavity beneath said piston, said pistons being extendable above said road surface so as to be engageable by passing vehicles;
 - c) a hydraulic fluid source connected to said cylinders and supplying hydraulic fluid to said fluid cavities thereof;
 - d) a pressure manifold communicating with said fluid cavities;
 - e) a turbine fluidly connected to said pressure manifold; and
 - f) an electric generator operatively connected to said turbine; wherein
 - g) as a passing vehicle engages said pistons, the weight of the vehicle pushes said pistons downwardly and causes hydraulic fluid to flow from said fluid cavity toward said turbine, said flow causing said turbine to rotate and said generator to produce electricity.

17. The power generation apparatus as in Claim 16 and further including a pressure control valve fluidly connected to said pressure manifold, said control valve selectively controlling an operating pressure within said cylinders.
18. The power generation apparatus as in Claim 17 wherein said operating pressure is matched to the minimum weight of vehicles passing over said cylinders.
19. The power generation apparatus as in Claim 17 and further including a sensor connected to said pressure control valve, said sensor adapted to read an indication of the weight of a vehicle approaching said apparatus and communicate a signal to said pressure control valve, said pressure control valve adjusting said operating pressure in response to said signal.
20. The power generation apparatus as in Claim 17 wherein said pressure control valve further controls flow through an accumulator circuit between said pressure manifold and said turbine.

21. The apparatus as in Claim 16 wherein each said cylinder includes only one fluid port, said fluid port being connected to a respective check valve, said check valve also being fluidly connected to said fluid source and to said turbine, said check valve allowing fluid to flow from said fluid source to said cylinder and from said cylinder to said turbine but preventing flow from said cylinder to said fluid source or from said turbine to said cylinder.
22. The apparatus as in Claim 16 wherein said piston is biased upwardly by a spring.
23. The apparatus as in Claim 22 wherein:
 - a) said piston includes an upper section and a lower section connected together by an intermediate rod;
 - b) an annular ledge extends into said cylinder from a cylinder wall thereof between said upper and lower piston sections; and
 - c) said spring is a compression spring positioned between said upper piston section and said annular ledge.
24. The apparatus as in Claim 23 wherein said upper piston section is removable from said intermediate rod through an upper end of said cylinder.